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Temperature and solids effect on gas-liquid mass transfer

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Abstract

The temperature and solids effect on the mass transfer characteristics in a bubble column was studied experimentally for the systems air/water/polyvinyl chloride (PVC) beads and air/water/expandable polystyrene (EPS) beads. Volumetric liquid side mass transfer coefficient, k_La, was determined under different temperatures (20, 25, 30, 35ºC), solid concentrations (up to 5%), gas flow rates (up to 7.4 mm/s) and solid sizes (549 and 210 µm for PVC beads, and 591 µm for EPS beads).

The results show that the temperature plays an important role on mass transfer phenomena, by increasing k_La and, simultaneously, promoting the solids influence on k_La.

The presence of solids affects negatively k_La being this effect more pronounced for the largest particles (PVC case). In addition, a decrease in k_La occurs when the solid loading increases (observed in both cases, PVC and EPS).

Comparing the PVC and EPS effects on k_La, it can be concluded that physical and chemical properties of solids are important parameters to be taken into account on this kind of studies.

An empirical correlation for k_La on the experimental variables was developed.